DOCUMENT RESUME

ED 316 222 IR 014 222

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TITLE Improved Teaching Excellence by Using Tutored Video Instruction: An Australian Case Study.
PUB DATE Aug 89
NOTE 14p.; Paper presented at the EAIR Forum (11th, Trier, West Germany, August 27-30, 1989).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Distance Education; Foreign Countries; Higher Education; *Instructional Effectiveness; Intermode Differences; *Student Attitudes; Tables (Data); Teacher Attitudes; Tutors; *Videotape Recordings
IDENTIFIERS Capricornia Institute Advanced Educ (Australia)

ABSTRACT

This paper describes the Tutored Video Instruction (TVI) technique, which uses videotaped lectures and student interaction in the presence of a tutor for instruction to small groups at branch campuses of the Capricornia Institute of Advanced Education (Australia). The development and operation of TVI, including staff briefing and preparation, production of the videotapes, and the role of the tutor, are covered. Costs of the system are presented, and staff and tutor reactions to the use of TVI are discussed. Student performance with TVI at branch campuses is compared with the performance of main campus students in the same subjects. Data on student reasons for enrolling at a branch campus, their reactions to the use of TVI, and their perceptions of the quality of the system are summarized. Based on analyses of the data, the following conclusions are offered: (1) TVI is cost effective if branch campus students progress to the main campus; (2) branch campus students were generally positive about TVI although it is not their preferred mode of delivery; (3) staff reactions to the use of TVI were positive; and (4) use of this technique may lead to an improvement in the quality of lecture delivery and student flexibility of learning. Six references are listed. (Author/MES)

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Presented at the 11th EAIR Forum:

"Towards Excellence in European Higher Education in the 90's"

University of Trier, FRG

August 27 - 30, 1989

IR014222

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ABSTRACT

This paper describes and presents some evaluations of the technique (Tutored Video Instruction - TVI) for using videotaped educational materials for the delivery of first year degree programs in Science, Business and Arts at branch campuses of a higher education institution. The method uses videotapes of lectures, as presented at the main campus, for instruction to small groups at branch campuses viewing the tapes with student interaction in the presence of a tutor.

The paper provides details of the organisation and operation of TVI, the costs of delivery of the system, details student perceptions of and performance through TVI, and staff and tutor perceptions of TVI.

Based on evaluation of the data, the use of TVI was found to be cost effective if branch campus students progressed to the main campus. Generally branch campus students were positive about the use of TVI although it was not their preferred educational delivery mode. Academic staff reactions were found to be positive towards the use of TVI on branch campuses. There is evidence to indicate that the use of this technology leads to an improvement in the quality of lecture delivery and in student flexibility of learning on the main and branch campuses.

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IMPROVED TEACHING EXCELLENCE BY USING TUTORED VIDEO INSTRUCTION: AN AUSTRALIAN CASE STUDY

INTRODUCTION

Higher education institutions that have a main campus and a number of feeder branch campuses face the problem of providing cost effective education programs at branch campuses that can capitalize on staff expertise on the main campus. Capricornia Institute, a member of the Australian Unified National System of higher education (and designated as the University College of Central Queensland from January 1990) has addressed this problem through the use of tutored video instruction (TVI). Capricornia Institute, located in the tropical region of Australia has four branch campuses, between 120 and 350 kilometres distant from the main campus. In 1989 the Institute has a total enrolment of about 5000 students studying programs to masters degree level.

In TVI, multiple videotape recordings are made of regular classroom lectures at the main campus. The video tapes are then used for instruction with groups of students (size < 16) in the presence of a tutor at the branch campus. The technique thus responds to the education needs of students by combining the expertise and skills of a main campus lecturer with the advantages of group discussion in which the videotaped lectures are used to provide a basis for discussion, during viewing of the videotape, between students and a tutor.

This paper reports the results of a study to analyse the efficiency and effectiveness of tutored video instruction as offered by Capricornia Institute at three of its branch campuses in 1988. More specifically, the paper will address the following matters:

(a) application of tutored video instruction at Capricornia Institute and some organisational issues related to this application;

(b) cost of tutored video instruction including variations of unit cost with student load and comparison with conventional teaching mode costs; and

(c) relative student academic performance and student and staff perceptions of the tutored video instruction method.

Although this paper is directed mainly at the use of tutored video instruction techniques to offer courses for students studying at branch campuses, it indicates that the technique also has relevance to the improvement of student learning on the main campus.

DEVELOPMENT AND OPERATION OF TVI

The technique of Tutored Video Instruction (TVI) was developed at Stanford University in the late 1960's where it was used as a means of offering graduate courses to engineers at nearby engineering companies. Video tapes were made of engineering lectures at Stanford. The tapes were then sent to subscribing companies who used them for staff development purposes. Evaluation showed that those who received their lectures through TVI sessions performed at least as well as students who attended live lectures at the University (Gibbons, 1977; Kincheloe, 1979). The technique was thought to be most effective for group sizes of ten through fifteen.

In 1986 Capricornia Institute trialled the use of TVI in a single semester subject of an undergraduate business course at one of its branch campuses. The results of this trial indicated that the academic results of students using TVI was at least equal to that of students at the main campus as measured by results in end-of-semester examinations (Dekkers and Honeysett, 1986). In addition students at both the branch and main campus found the video tapes to be a useful resource for revision of work and for missed lectures.

On the basis of this trial it was decided to implement the use of TVI as three further branch campuses were established by Capricornia Institute in the Central Queensland region in the period 1987 - 89. In 1989 TVI is used at four branch campuses for the offering of first year business, arts and science degrees. The extent of use is summarised in the Table 1 below.

Table 1

Use of TVI at Branch Campuses

Year	No of Branch Campuses	No of semester courses using TVI			
		Business	Arts	Science	Total
1986	1	Single subject trial	-	-	1
1987	1	6	-	9	15
1988	3	6	6	9	19
1989	4	8	6	9	23

1. Staff Briefing and Preparation

Main Campus lecturing staff who are to offer videotaped lectures are provided with a short training session to familiarise them with the capabilities and limitations of the technique and with the equipment, and are assisted to accommodate the characteristics of the video recording system to their differing lecturing styles (e.g. ways to organise the chalkboard space, effective presentation of demonstrations, requirements for overhead transparencies etc). Opportunities are also provided for staff to give short rehearsal lectures to familiarise themselves with the techniques and the use of equipment.

In addition to this preparation for a video lecture, lecturers visit tutors at the branch campuses, have teleconference sessions with them about key points and issues of each lecture, possible student discussion questions, answers to likely student questions, suitable times to stop the video tape etc. A number of lecturers also provide voice prompts during the lecture and copies of overhead transparencies and other information to the branch campus tutors.

2. Production of the Videotapes

Two lecture rooms have been equipped and timetabled for video recorded lectures with two (ceiling suspended) steerable video cameras in each with zoom lenses to enable close up views of overhead projections, writing on chalkboard and for generating split screens. A bank of 7 video recorders (for the simultaneous production of multiple copies of tapes), a radio microphone for the lecturer and a microphone for students receiving the lecture live to ask questions are also provided. While the quality of equipment needs to be high, the recording system is relatively simple and requires one relatively low cost technical assistant to produce satisfactory results.

At the completion of each lecture, the tape copies are labelled prior to forwarding to each of the four branch campuses by public road transport. Generally tapes are available at each branch campus on the day following the live lecture at the main campus. A copy of each tape is kept in the closed reserve of the main campus library and a further copy is made available in the library for use by main campus students. After playback/discussion, the branch campus tape is placed in the branch campus library for the duration of the year for further use by branch campus students. The seventh copy is held by the Department of the Institute with which the lecturer is associated and may be used for remedial work. One such use is with first year overseas students who may have difficulties with technical English.

3. Tutored Video Instruction - Role of the Tutor

The branch campus tutor's main functions are as facilitator, motivator and initiator of questions during the videotape playback. The tutor must encourage students to request the videotape to be stopped for immediate resolution of problems, and whenever important concepts are stressed or

alluded to by the lecturer on the tape. The success of TVI presentations is linked closely with the group interaction which must be encouraged by the tutor during (and indeed after) the viewing of the video taped lecture.

In order to assist tutors to fulfil their role, they are required to visit on-campus staff prior to the start of each semester to ensure familiarity with the course, to discuss issues and problems that students have encountered in the past, and to consider ways that can be used to make each TVI session an effective learning experience for students.

COST OF TUTORED VIDEO INSTRUCTION

Past researchers have shown that distance education involves a significant proportion of fixed costs which in turn implies that economies of scale should apply. This has been shown, for example, by Wagner (1977) for the British Open University and by Sharma (1983) for the integrated model of distance education in Australia. Similar results would be expected with TVI which is a form of distance education. This section considers the cost issues involved in the provision of TVI programs at branch campuses.

Cost issues will be considered by examining the first year (5 x 2 hour lectures/week for 28 weeks of TVI) of the 1988 Bachelor of Business program as a case study. This program was offered in three of the branch campuses of Capricornia Institute in that year. There were approximately 15 ($^{+}$2) students in each of the TVI groups at the three branch campuses.

The production of the videos for TVI generates fixed costs on the main campus as shown in Table 2.

Table 2

Main Campus Costs for TVI

Item	Cost ($) Per Year
TVI (2 hour) tape costs (seven copies of each tape)	6,370
Technician time for taping, labelling and despatch (+ overheads)	6,720
Transportation costs for tapes	2,100
Amortisation of TVI equipment	14,000
Total fixed cost at main campus	29,190

Table 3 presents the costs for the delivery of TVI at the branch campuses.

Table 3

Branch Campus (3) Costs for TVI

Item	Cost ($) Per Year
Proportion of lease of premises at three branch campuses	20,000
Amortisation of equipment at branch campuses	20,000
Proportion of office support staff salaries (+ overheads)	39,600
Academic salaries for tutorials (+ overheads)	142,000
Total branch campus costs	221,600

It can be seen that the total cost of TVI for the Business program is approximately $250,000 for 3 x 15 students or approximately $5,560 per student. At the branch campuses the leasing of premises, the amortisation of equipment and office support staff salaries can be regarded as fixed costs whilst the last item above can be regarded as variable. So the total cost function for the first year Bachelor of Business TVI program is given by

$$TC = 108790 + 3156\,S$$

where TC is equal to the total cost of tutored video instruction and S is equal to student load (EFTSU).

The above total cost function for TVI can be used to examine changes in cost per equivalent full-time student unit as a result of changes in student load at any branch campus. Table 4 summarises the variation in unit cost as a result of increasing student load from the base load of 45 EFTSU.

Table 4

Total Cost Function for TVI

Student Load (EFTSU)	Unit Cost ($ per EFTSU)	% Change in Unit Cost
45	5,573	N/A
60	4,969	-10.9
90	4,360	-21.7
105	4,192	-24.8

In 1988, the total number of first year Business students at the three branch campuses was 47 + 17 + 38 = 102.

These data show that the cost per EFTSU is quite sensitive to changes in student load at the branch campuses. As the 1988 operating costs per EFTSU for the first year of the Bachelor of Business program at Capricornia Institute overall was approximately $3,530, the offering of Bachelor of Business programs at the three branch campuses appears to have significantly higher unit cost than is applicable to a first year main campus student taking the same program. However, this comparison ignores the fact that on completion of their first year program (using TVI) at branch campuses, students normally transfer to the main campus where some marginal costs will apply as these students progress to the second and third years of their courses. The effect of this will be to render TVI more cost efficient than indicated by the above data.

As the annualized capital costs for Business programs at the main campus is approximately $1,100 (amortisation of buildings over 40 years assuming an interest rate of 10 percent) and the averaged operating costs for the whole of the Business degree is $4,100, the total average unit cost for the course will be (4100 + 1100) or $5200 per equivalent full-time Business student.

The costs relating to branch campus students who have transferred to the main campus may be quantified approximately under the following assumptions:

(i) no additional costs will be incurred for the lectures given to students who have transferred from first year branch campuses to the main campus;

(ii) all other costs will be the same as those for an average student.

Business students sustain 50 percent of their class contact time in the lecturing mode of instruction on the main campus and as a general rule, academic salaries constitute approximately 50 percent of the total operating costs of instruction. Applying these assumptions, Table 5 presents the cost for each of the three years of the groups of students who were taught the first year of their Business degree on branch campuses using TVI. This costing assumes 75 percent retention to the second and third years of the course:

Table 5

Costing of Business Degree with Student Transfer to Main Campus

Year of Course	Student Load (EFTSU)	Estimated Total Expenditure Including Amortised Capital Cost ($)		Total Cost ($/EFTSU)
1st Year (Branch Campus)	45	250,000		5,560
2nd Year (Main Campus)	34	127,000		3,750
3rd Year (Main Campus)	25	108,000		4,320
Total	104	485,000	Average for Course	4,660

This analysis indicates that the average unit cost of approximately $4,660 for students who commence programs on the branch campuses and finish on the main campus is comparable with the average unit cost of a Business degree student at Capricornia Institute ($5,200). Thus within the accuracy of the calculation it may be concluded that the use of TVI at a branch campus is as cost efficient as main campus programs provided students transfer to the latter after the first year.

STAFF REACTIONS TO THE USE OF TVI

Interviews were conducted with twenty three staff members who have been and are involved in the delivery of TVI lectures. A summary of staff reactions and comments is as follows:

1. TVI as a Method of Instruction

Once familiar with the approach, lecturers were overall very supportive of using TVI as a method of instruction for students on branch campuses. It was seen as a means whereby these students were not disadvantaged, insofar as they were able to receive the same lecture content and presentation as main campus students. The use of tutors for the viewing and discussion of the video tapes was seen by lecturers as an effective way of teaching branch campus students.

2. Preparation for TVI Lectures

The majority of lecturers asserted that initial preparation for TVI lectures increased workload. This was attributed to

- more time required to prepare lecture material. Lecturers commented that they tended to overprepare.
- extra time needed to prepare visuals. There was a tendency to use more visual material for the delivery of TVI lectures compared to non-taped lectures.
- the mode of presentation of TVI lectures was different to the normal delivery style of a number of lecturers and this resulted in extra preparation time .
- consultation was required with the technician taping the lectures.
- time was needed to brief tutors prior to the presentation of and during the lecture course.

- additional preparation time was required to prepare materials for the tutors e.g. model answers to questions, handouts for students.

A positive outcome, volunteered by a number of lecturers, was that they felt their lecture presentations had improved and this was supported in a number of instances by face-to face student feedback. The tapes of the lectures being used subsequently by main campus students was seen as a significant additional benefit. Videotape loan statistics from the library indicated that many students borrowed tapes overnight to fill in lectures that had been missed or to clarify particular points during revision. Personal ownership of videotape players is high in Australia.

3. Delivery by the TVI Lecturer

The most common reaction from lecturers was that TVI recording limited and restricted their lecturing styles, such that their lectures had become more depersonalised. Associated concerns of TVI lecturers included

- the need to limit ambulations during the lecture
- the need to control lecture mannerisms
- greater care in the use of the chalk board and preparation of overhead transparencies
- difficulty in having interaction with students. As main campus classes are generally large, students' questions usually needed to be repeated
- the need to avoid possible defamatory or derogatory statements, recorded "for posterity" on videotape.

It was asserted by some lecturers that delivery of a TVI lecture was more of a "performance" and that there was added pressure to do well and to ensure that things did not go wrong(!). A number of lecturers admitted to being sensitive to the feeling of being videotaped and that they had a tendency to overprepare and in some cases to script the lecture. A surprisingly small proportion (approximately 50 percent) of staff had viewed themselves lecturing subsequently with a view to improving style etc.

4. Support and Staff Development for TVI

All staff were initially new to the use of TVI, and all considered that the need for training sessions and workshops on the capabilities and limitations of the technique were essential. Lecturers in particular wanted to know the practicalities of TVI lecturing, such as the best way to use board space, requirements (e.g. colour sensitivities) for the preparation of transparencies, identification of inappropriate mannerisms, etc.

TUTOR REACTIONS TO THE USE OF TVI

Interviews were conducted with thirteen branch campus tutors (both full-time and part-time) involved in the presentation of TVI lectures. The tutors considered that the most important factor to ensure an effective tutorial session was familiarity with the course and confidence in the lecturers expectations. Tutors indicated that it was necessary for them to have regular telephone or face-to-face discussions with the lecturer to ensure that they were fully familiar with the course and to discuss with the lecturer any recurring or new problems that were being experienced by students.

Other factors that tutors alluded to as important for educationally effective TVI sessions were:

- having the opportunity to preview the videotape
- having available at the TVI sessions, lecturer information such as key questions or points that need to be reinforced and answers to possible questions

- the tutor's attitude and personality and the style of the lecturer on the TVI tape
- tutor knowledge of the subject matter and in particular the ability to be able to answer or respond to student questions.
- that a group size of less than 3 was unsatisfactory for a TVI session as was a group size of more than 15 students.
- active students' participation both during or after the tape presentation. This required the tutor to be prepared for the video presentation and have the necessary skills to ensure active student participation.

Overall, tutors felt that they had received good support from lecturers but felt that there was a need for workshops to develop further skills in student small group work.

STUDENT PERFORMANCE WITH AND PERCEPTIONS OF TVI

1. Comparative Student Performance

The principal goal of using alternative educational techniques is to foster academic excellence through enhanced student learning at an economic cost. Thus a technique should not only be used for cost efficiency reasons but should provide pedagogical conditions which are equal or superior to traditional teaching methods. The outcomes of the use of TVI at the branch campuses were considered by comparing branch campus student performance relative to main campus students in the same subjects. The student performance indicator used is the Grade Point Average (G.P.A.) for the latest available year (1988). GPA was measured by assigning a grade point ranging from 2 for a subject failure to 7 for a high distinction result. If the grade point achieved for subject i of a student is GPi then the grade point average for that student is defined by

$$GPA = \frac{\Sigma\, GPi}{\Sigma\, i}$$

The GPA measure was used to compare relative performances of main campus and branch campus Arts, Business and Science students; relevant data is displayed in Table 6 below.

Table 6

Course	Mean GPA	Standard Deviation
Bachelor of Applied Science		
- Main Campus	3.56	1.13
- Branch Campus 3	4.86	1.05
Bachelor of Business		
- Main Campus	4.17	1.03
- Branch Campus 1	4.37	0.79
- Branch Campus 2	3.46	1.08
- Branch Campus 3	4.30	1.07
Bachelor of Arts		
- Main Campus	4.39	0.93
- Branch Campus 2	4.72	1.05
- Branch Campus 3	4.89	0.78

The following conclusions are evident from these data:

- the mean GPA of branch campus first year Science students was nearly 37 percent higher than observed for corresponding students at the main campus. This

difference in mean GPA was highly significant ($p < 0.01$) permitting the conclusion that branch campus Science students performed better than main campus students.

* performance of first year Business students at Campus 2 was significantly lower than the achievement of their counterparts on the main campus ($p < 0.01$).

* Campus 3 first year Arts students out-performed their counterparts at the main campus ($p < 0.01$) with the former achieving 11 percent better grade point average than the main campus students.

The quality of the student intake for the two groups (Main Campus, Branch Campuses) as measured by tertiary entrance (TE) scores was not highly significant for 1988:
(Branch Campus mean TE score = 828.62, S.D. = 56.25, n = 98; Main Campus mean TE score = 813.39, S.D. = 71.16 n = 383,
F = 3.867,
p = .0498).
However, Cochrane and Sharma (1989) have shown that overall student performance does not vary to any great extent with tertiary entrance scores in this range (TE entry scores were found to explain only about 8 percent of the variation in student performance). Thus the data suggests that TVI can be regarded as an effective delivery mode compared to conventional educational methods.

STUDENTS PERCEPTIONS OF TVI

1. Data Collection

A questionnaire to seek student perceptions of the use of TVI was pretested in the four branch campuses operating in 1989. The revised questionnaire was completed by 144 out of 384 branch campus students responded giving a response rate of 42 percent. Statistical testing of the proportion of the male students in the sample (42.6 percent) and those in the population (44.4 percent) indicated there is no difference in the sex mix of students ($Z = .042$, $P > 0.05$). This provides some confidence that the conclusions from the sample can be applied to the total population of branch campus students.

2. Student Reasons for Enrolling at Branch Campus

Just over 63 percent of branch campus students indicated that they were living at home with parents. Information provided by students indicated that the direct private costs of higher education more than doubles when a student is living away from home increasing from a mean figure of $1,133 to $2,384 per semester. (The latter cost is considered an under estimate on the part of the students.) Thus the provision of courses at branch campuses had the effect of reducing family private costs of higher education considerably. Student perceptions regarding enrolment at the branch campus may be summarised as follows:

- just over 80 percent of branch campus students enrolled in the program because the course was available at the branch campus;

- 73 percent of the respondents indicated a preference for staying in their home town for the first year of their course;

- 60 percent of the respondents indicated that their parents/family preferred them to study close to their home location;

- 45 percent of the responding students indicated that they selected branch campus study because of the lower costs involved in being able to live at home;

- 21 percent of the students indicated that they were studying through the branch campus because they wanted to find out whether they could undertake higher education studies successfully.

3. Student Reaction to the Use of TVI

Student preferences for different systems of delivery is summarised in Table 7. It shows that the greatest proportion of students preferred face to face lectures followed by tutorials (60 percent). Tutored Video Instruction, though the next preferred delivery mode (17 percent) was very much less well favoured. Only a very small percentage of students (4 percent) preferred private study at home (external study).

Table 7

Most Preferred Higher Education Mode

Most Preferred Delivery Mode	% of Respondents
Face-to-Face Lectures Only	14
Face-to-Face Lectures Followed by Tutorials	60
Tutorials	12
Tutored Video Instruction	17
Private Study at Home (External Studies)	4

Note: Percentages do not add up to 100 percent since some students have indicated that more than one delivery method is the most preferable.

4. Quality of TVI

Branch campus students were asked to use a five point scale rating (excellent = 1 to very poor = 5) to indicate their perceptions of the quality of the TVI exercise on branch campuses.

Table 8 summarises the responses received from the students.

Table 8

Student Perception of the Quality and Use of TVI

Item	Mean Perception
General Rating of each Tutorial Accompanying the Video Viewing	2.17
Preparedness of the Tutor	1.93
Assistance Provided by the Tutor	1.88
Assessment Procedures used by the Tutor	2.09
Encouragement Provided by the Tutor	2.00
Extra Material Provided During TVI Session	2.35
General Rating of each TVI Video Presentation	2.35
Quality of Lecturer's Explanation on the Video	2.24
Orderliness of the Lecturer's Presentation	2.18
Suitability of the Material Presented	2.12
Clarity of the Lecturer's Presentation	2.15
Use of Audio Visual Materials	2.46
Quality of TVI Sound	1.91
Quality of TVI Picture	1.89
Quality of TVI Overhead Projectors	2.84
Quality of the Blackboard Work by Lecturers	2.73

Steps are currently being taken to address the less favourable perceptions of the students. Thus for example, further work with lecturers on the clarity of overhead transparencies and better use of blackboard during lectures is being undertaken through the production of an instructional videotape for TVI lecturers.

CONCLUSIONS

The offering of first year degree courses at small remote branch campuses in a non-industrial/primary industry based region of Australia has been possible through the use of tutored video instruction (TVI) using the high level of expertise and skills of main campus staff supported by tutors recruited in each of the local centres.

Analysis of the educational effectiveness and the cost efficiency of the exercise indicates that TVI is effective as measured by performance comparisons for branch and main campus students and is cost efficient if branch campus students progress to complete their courses at the main campus. Significant enhancement of access to higher education in a region of dispersed population, together with reductions in social costs have been achieved. Staff perceptions of the use of TVI are positive, and although not the teaching mode preferred by students, the technique has been accepted by them without problems. Additional benefits for main campus students have become evident through the retention of videotaped lectures for their later use, and for remedial work.

The relatively simple and well-established technology of the tutored video instruction technique may have application in other higher education institutions with dispersed feeder campuses.

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